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Doha Merchandise Trade Reform: What's at Stake for Developing Countries?

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Abstract

This paper provides new estimates of the global gains from multilateral trade reform and their distribution among developing countries in the presence of trade preferences. Particular attention is given to agriculture, as farmers constitute the poorest households in developing countries but the most assisted in rich countries. The latest GTAP database (Version 6.05) and the LINKAGE model of the global economy are employed to examine the impact first of current merchandise trade barriers and agricultural subsidies, and then of possible reform outcomes from the WTO's Doha Development Agenda. The results suggest moving to free global merchandise trade would boost real incomes in Sub-Saharan Africa proportionately more than in other developing countries or high-income countries, despite a terms of trade loss in parts of that region. Net farm incomes would rise substantially in that and other developing country regions, thereby alleviating rural poverty. A Doha partial liberalization could move the world some way towards those desirable outcomes, but more so the more developing countries themselves cut applied tariffs, particularly on agricultural imports.

JEL codes: C68, D58, F13, F17, Q17

Key words: Trade policy reform, WTO, multilateral negotiations, computable general equilibrium, developing countries

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Introduction

The aims of this paper are threefold: to summarize the costs of current merchandise trade distortions to developing and other economies; to examine some scenarios that might emerge as part of an eventual Doha Development Agenda agreement consistent with the 2005 Hong Kong (China) Ministerial Declaration (WTO 2005), particularly with respect to agriculture; and to draw out implications for the strategies developing countries might adopt in the WTO's Doha round of multilateral trade negotiations.

More specifically, the paper shows what the world economy could look like in 2015 without and with a successful conclusion to Doha, how far Doha could take the world towards where it would be in the absence of all distortions to merchandise trade, and what contribution could be made by the various elements of a Doha package. For present purposes we make use of a recursive model of the global economy known as LINKAGE (see van der Mensbrugghe 2005a), which has formed the basis for the World Bank's standard decade-long projections of the global economy and its earlier trade analysis (e.g., World Bank 2002, 2004). We also use the latest version (6.05) of the GTAP Database, which includes the tariff preferences enjoyed by many developing countries (see www.gtap.org). The distinction is made in our results between effects on developing countries as compared with more advanced economies, but in doing so it is necessary to take into account not only the World Bank's classification of economies based on income level but also the self-nominated one practiced in the WTO (in which even economies as advanced as Hong Kong (China), Singapore, the Republic of Korea and Taiwan (China) claim developing country status and so are eligible for Special and Differential Treatment (SDT) including lesser tariff cuts and longer phase-in periods than what is eventually agreed for developed countries under Doha).

Our analysis suggests most of the potential gains from multilateral reform are from agriculture but, because of large gaps between WTO-bound and applied rates of protection, there

would be little real agricultural reform globally as a result of the Doha round – especially by developing countries – unless WTO Members are willing to make very substantial cuts to their bound tariff rates and domestic farm subsidy commitments. . We therefore explore the effects of a more ambitious agricultural reform package, and of developing countries participating more fully in the Doha round rather than invoking SDT to avoid reform. In both respects we show how much closer the world could get to exploiting the full benefits of trade if these more-ambitious reform commitments were to be made and implemented over the next decade. If WTO members insist on classifying even just a small number of farm products as "Sensitive" and subject to lesser tariff cuts, however, the gains from agricultural reform could be greatly diminished – and even disappear for developing countries.

The paper begins with an overview of the key elements of a prospective Doha agreement, consistent with the Hong Kong Ministerial Declaration (WTO 2005), focusing especially on the agricultural elements. It then describes the model of the global economy to be used to analyze the consequences of such an agreement, and of alternative more-ambitious reforms including a move to complete free trade (which provides a helpful benchmark). The estimates of protection and subsidy rates for each region are a crucial part of the data in the global model, and so they are examined before turning to the key results of the simulations. After discussing some qualifications, the paper concludes by drawing out implications for developing countries.

Key elements of a prospective Doha agreement

To what extent are trade and subsidy reform commitments likely to emerge from the Doha round? In addressing that question, it needs to be kept in mind from the outset that WTO trade negotiators are seeking agreement on reductions not to the applied tariffs and subsidies but rather to members' legally bound import tariffs, agricultural export subsidies and bound commitments on domestic support to farmers. These bound rates are higher than applied rates in nearly all countries, but especially so in most developing countries, reducing the impact of cuts on market access.

The Doha round was launched at the WTO Trade Ministerial meeting in Doha in late 2001, but the following Ministerial meeting, in Cancún in September 2003, ended with acrimony and without an agreement on how to proceed. At Cancún, developing countries made it

abundantly clear that further progress would not be possible without a commitment by developed countries to significantly lower their agricultural subsidies (including importantly for cotton, despite its relatively minor role in developed country agriculture – see Sumner 2006). The so-called July Framework (WTO 2004) and the Hong Kong Ministerial Declaration (WTO 2005) reiterate the importance of keeping development at the heart of the Doha agenda, and particularly stress agricultural reform as key to that. In their Annexes, these documents provide guidance as to how a Doha agreement might be structured, with frameworks for establishing modalities for agriculture and for non-agricultural market access, as well as providing recommendations for trade in services.

Agricultural market access

Jean, Laborde and Martin (2006) examine the consequences of different tariff-cutting formulae, bearing in mind agricultural tariff rate quotas (TRQs), the prevalence of preferences for developing countries as described in Bouet, Fontagné and Jean (2005), the need to accommodate "Sensitive" and "Special" farm products, and the Special and Differential Treatment outlined in the July Framework. For present purposes, tariff cutting is implemented at the 6-digit HS level of commodity disaggregation and involves a detailed comparison of each country's bound tariff, which is what negotiations focus on, with the applied MFN tariff on a given bilateral trade flow, which is what affects economic outcomes. The gap between bound and applied MFN tariffs is the so-called binding overhang, and can blunt significantly the impact of any negotiated outcome – so much so that, in some Doha scenarios, some countries are not required to change their applied tariffs at all. Once the detailed tariff analysis was conducted, the results were aggregated up to the GTAP and Linkage models' regional and sectoral levels. Note that the applied tariff cuts vary not only by sector, but also by trading partner – and may involve smaller or no cuts on imports from those developing countries currently enjoying non-reciprocal preferential access to richer countries' markets (Hoekman and Ozden 2005).

Jean et al. (2006) evaluated the consequences for 2001 applied rates of different approaches to liberalization, and particularly different degrees of top-down progressivity in the bound tariff cuts, as well as different degrees to which developing countries participate in reform. They looked first at a proposal similar to the Harbinson progressive reduction formula (see WTO 2003b), with marginal tariff rate reductions of 35% for tariffs below 15 percent, 65%

for tariffs above 90 percent and 60% for tariffs within the 15-90 percent bracket.[1] Developing country tariff cuts also follow the progressive-tax-style tiered formula, but for them Harbinson suggested four rather than three brackets, with inflexion points placed at tariff levels of 20, 60 and 120 percent, so as to be consistent with Harbinson's criterion of cutting by an average of 25%, 30%, 40% and 45%, respectively, in those four brackets.

That set of tariff cuts, it turns out, would lead to very little import liberalization, because bound tariffs in many countries exceed applied rates by such large margins. As a result, Jean et al. focused on a set of reforms that involve cuts in applied agricultural protection rates that are at least 10 percentage points greater, namely a 45%, 70% and 75% bound rate cutting rule for developed countries and a 35%, 40%, 50% and 60% cutting rule for developing countries[2]. These cuts are within the (wide) range proposed by key WTO members in the lead up to the Ministerial.

Jean et al. then examine, and we model, the consequences of:

- allowing lesser tariff cuts for self-nominated "Sensitive" farm products assuming countries would take into account the importance of the commodity, the height of the tariff, and the gap between the tariff binding and the applied rate in deciding which products to grant such treatment, comparing situations in which countries are allowed to treat 2 percent of agricultural and food tariff lines as sensitive and subject to just a 15 percent tariff cut;
- including "Special" agricultural products just for developing countries, by adding another 2 percent of agricultural tariff lines as subject to just a 15 percent tariff cut; and
- adding a tariff cap of 200 percent, consistent with the suggestion in paragraph 30 of the Framework agreement that the role of a tariff cap be explored.

Agricultural domestic support

Reductions in domestic support have been a particular concern of developing countries. This reflects the fact that the developed countries are the major providers of such assistance, and

[1] This approach provides cuts in average tariffs -- without the discontinuities created by the proportional cuts involved in the Harbinson formula -- that are more or less comparable with those generated by Harbinson's proportional reductions of 25%, 30% and 60%, because the larger cuts on higher tariffs apply only on the portion of the tariff above 15 or 90 percent, respectively.

[2] With no cuts in least developed countries, as specified in the Framework and the Ministerial Declaration.

many developing countries are concerned about the ability of their producers to compete with developed country farmers receiving large amounts of domestic support from their governments. While the marked asymmetry between industrial and developing countries is a concern, there is evidence, from Hoekman, Ng and Olarreaga (2004), Hertel and Keeney (2006) and Anderson and Valenzuela (2005), that the benefits to developing countries from reductions in developed-country domestic support may be substantially smaller than the potential gains from reductions in market access barriers. Nonetheless, disciplining such support is crucial not just to prevent policy reversals but also to ensure that when tariffs are lowered, import protection is not simply replaced by equally or more-distorting domestic measures.

The Framework agreement and the Ministerial Declaration propose tiered reductions in the total bound Aggregate Measure of Support (AMS), with larger reductions by Members with higher initial AMS levels. It turns out that extraordinarily large reductions in bound AMS are required before any reductions in actual support would occur. If all countries with AMS notifications above 20 percent of the value of production cut their bound protection by 75%, and all others by 60%, only four members would have to cut *applied* rates as of 2001: the US by 28%, Norway by 18%, the EU15 by 16%, and Australia by 10%.

Agricultural export subsidies

Export subsidies for non-farm goods are outlawed in the WTO, so eliminating farm export subsidies would simply be bringing agriculture into line with other goods. The empirical analyses summarized in Hertel and Keeney (2006) and Anderson and Valenzuela (2005) show that those subsidies contribute only a small part of the welfare cost of agricultural support programs. That is true even when implicit subsidies in the form of food aid and export credits are included. A phase-out by 2013 of both explicit and implicit forms of farm export subsidies, as agreed at the Hong Kong Ministerial, should therefore be a politically feasible component of a comprehensive Doha agreement. Their elimination in isolation could harm a few food-importing and aid-dependent developing countries, but the poor net buyers of food in those countries can be assisted other more-direct and hence more cost-effective forms of aid than via these measures.

Non-agricultural market access

Negotiations in the area of non-agricultural tariffs have been lagging those on farm products. There has been a clear indication that developing countries wish to make lesser tariff cuts than developed countries and that least-developed countries expect to not have to make any cuts. A Doha round is unlikely to involve all non-agricultural bound tariffs being cut by more than 50 percent, so we assume there will be that degree of cut by developed countries and 33 percent by developing countries other than least-developed ones (from whom no cuts are being demanded). However, since that bound cut may lead to very little reduction in applied rates by developing countries, given their high tariff bindings relative to their applied tariffs, a more ambitious scenario involves them committing to more reform (in return for which they could seek reciprocity in the form of further cuts in developed countries' agricultural and textiles tariffs). The most optimistic possibility considered is that developing (including least developed) countries agree to cut non-agricultural bound tariffs as much as developed countries (that is, by the 50 percent we assume).

Services trade

WTO members have been very slow in coming forward with Doha proposals to reform services trade. At this stage it seems likely that, as with the Uruguay Round, countries will make few meaningful commitments to genuinely open up their services sectors as part of the Doha round. For that reason, and because services trade is less-adequately represented in trade models than is goods trade, we have not included any reductions in this sector in our analysis – despite the fact that, as indicated in Hertel and Keeney (2006), gains from services reform could well be enormous, including for developing countries.

The global LINKAGE model for assessing effects of future trade reform

For this analysis we use a global computable general equilibrium (CGE) model known as LINKAGE. It is a relatively straightforward CGE model but with some characteristics that distinguish it from standard comparative static models such as the GTAP model (described in Hertel 1997). A key difference is that it is recursive, so while it starts with 2001 as its base year it can be solved annually through to 2015. This is important when evaluating a reform that is likely

to take a decade or more to be fully implemented, because the structure of the world economy will be quite different in 2015 than it was in 2001. Economic expansion in the model is driven by exogenous population and labor supply growth, savings-dependent capital accumulation, and exogenous labor-augmenting technological progress (as used in the World Bank's *Global Economic Prospects* report in 2004 and as detailed in van der Mensbrugghe 2005a). In any given year, factor stocks are fixed. Producers minimize costs subject to constant returns to scale production technology, consumers maximize utility, and all markets – including for unskilled and skilled labor, both of which are intersectorally mobile – are cleared with flexible prices. Also consistent with our focus on long-run adjustment to reform, the aggregate supply of farm land is defined by an overall upward sloping supply function, with land-abundant countries having a higher land supply elasticity; and that land is allocated across agricultural activities using a constant elasticity of transformation (CET) function. There are three types of production structures. Crop sectors reflect the substitution possibility between extensive and intensive farming; livestock sectors reflect the substitution possibility between pasture and intensive feeding; and all other sectors reflect standard capital/labor substitution. There is a single representative household per modeled region, allocating income to consumption using the extended linear expenditure system. Trade is modeled using a nested Armington structure in which aggregate import demand for each sector's product is the outcome of allocating domestic absorption between domestic goods and aggregate imports, and then aggregate import demand is allocated across source countries to determine the bilateral trade flows.

There are various sources of protection in the model. The most important involves bilateral import tariffs. There are also bilateral export subsidies. Domestically, there are subsidies only in agriculture, where they apply to intermediate goods, outputs, and payments to capital and land.

Household consumption and savings are represented by the Extended Linear Expenditure System, which provides a rigorous framework for modeling consumption/savings decisions and allocation of consumption spending across commodities (Lluch 1973). Government fiscal balances are fixed in any given year, with government spending fixed as a share of GDP and the

fiscal objective being met by changing the level of lump sum taxes on households.[3] This implies that losses of tariff revenues are replaced by higher direct taxes on households. The current account balance is fixed, primarily for convenience[4] in this recursive- model but also consistent with the Feldstein-Horioka finding of limited international capital mobility (Feldstein and Horioka 1980; Ventura 2003). Finally, investment is driven by savings. With fixed public and foreign saving, investment is determined by changes in the savings behavior of households and changes in the unit cost of investment. The model only solves for relative prices, with the numéraire, or price anchor, being the export price index of manufactured exports from high-income countries.

The newest version of the LINKAGE model, Version 6.0, is based on the latest release of the GTAP dataset, Release 6.05. Compared with Version 5 of the GTAP dataset, Version 6 has a 2001 base year instead of 1997, updated national and trade data and, importantly, a new source for the protection data (see www.gtap.org for details). The new protection data come from a joint CEPII (Paris)/ITC (Geneva) project. The product of this joint effort, known as MAcMaps, is a HS6 tariff level detailed database on bilateral protection that integrates trade preferences, specific and compound tariffs and a partial evaluation of non-tariff barriers such as tariff rate quotas (TRQs).[5] The new GTAP database has lower tariffs than the previous database. This is because of the inclusion of bilateral trade preferences, as well as the major reforms between 1997 and 2001 such as continued implementation of the Uruguay Round agreements, and China's WTO accession which alone contributed to the ratio of global exports plus imports to GDP rising from 44 to 46 percent over those four years.

The version of the LINKAGE model used for this study is comprised of a 27-region, 25-sector aggregation of the GTAP data set. There is a heavy emphasis on agriculture and food, comprising 13 of the 25 sectors, and a focus on the largest commodity exporters and importers.

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3 For the sake of simplicity they are fixed in US$ terms at their base year level, minimizing potential sustainability problems; but this implies they decrease over time as a percentage of GDP for expanding economies.

4 Only with fixed financial inflows from abroad can utility changes be used to provide a money-metric measure of welfare changes resulting from a reform.

5 More information on the MAcMaps database is available in Bouët et al. (2004) and at http://www.cepii.fr/anglaisgraph/bdd/macmap.htm. For a detailed analysis of the differences between the results presented in this paper and (a) those using the Linkage model but the earlier GTAP Version 5 database, and (b) those using the same Version 6 database but the GTAP model, see Anderson, Martin and van der Mensbrugghe (2006a, Appendix 12A) and van der Mensbrugghe (2006).

The subsidies and import protection dataset

The main source of protection is tariffs or border barriers, although some countries – particularly high-income countries – also have significant agricultural production and export subsidies. The average import tariff for agriculture and food in 2001 is 16.0 percent for high-income countries and 17.7 percent for developing countries, while for manufactures other than textiles and clothing it is 8.3 percent for developing countries and just 1.3 percent for high-income countries. The averages of course obscure large variations across countries and commodities. For example, if high-income countries' tariffs on temperate farm products are at a near-prohibitive 100 percent but zero on tropical products such as coffee, the import-weighted average agricultural tariff could be quite low. Even at a relatively aggregated level, the variations can be quite sharp. For example, India has an average tariff in agriculture and food of 82 percent on imports from East Asia, but only 20 percent on imports from Sub-Saharan Africa. Also, high-income countries' agricultural tariffs on goods from low-income countries are lower than on imports from the high- and middle-income countries, while imports of textiles and clothing from low-income countries face a higher average tariff than imports from middle- or high-income countries.

Estimates of welfare impact of current protection policies

The LINKAGE model provides a baseline projection of the world economy first to 2005 and then to 2015 assuming no other policy changes. Deviations from that baseline in 2015, due to phased partial or total liberalization from 2005, are then examined.

One benchmark against which to measure the prospective benefits of Doha is that which would come from freeing merchandise trade (including removing all agricultural producer and export subsidies) completely over the 2005-2010 period. That leads to global gains by 2015 of $287 billion per year, according to the LINKAGE model. Another benchmark is the reform incorporated in the pre-simulation experiment for the period from 2001 to end-2004, due to the final stages of Uruguay Round implementation including the phase-out of the Multifibre Arrangement (MFA), the accession of China and Taiwan (China) to the WTO, and the eastern

enlargement of the European Union from 15 to 25 members.[6] The impacts of those reforms on import tariffs are non-trivial. Had those three reforms not been implemented, the gains in 2015 from freeing global merchandise trade would have been $341 billion instead of $287 billion, or an extra $54 billion per year. Nearly half of that difference is due to the removal of MFA export quotas and hence should be considered part of the Uruguay Round's legacy – assuming safeguards by high-income countries or export restraints by China do not replace textile and clothing quotas from 2005.[7]

Table 1 reports the distribution across regions of the standard economic welfare or real income (equivalent variation) effects of removing all merchandise trade distortions (including agricultural subsidies) globally. Of the $287 billion gain in income that reform would generate for the global economy per year by 2015, two-thirds would accrue to the high-income countries. However, as a share of national income, developing countries (as self-defined by WTO members) would do twice as well, with an average increase of 1.2 percent of national income over the baseline compared with 0.6 percent for high-income countries. The results vary widely across developing countries, ranging from little impact in the case of Bangladesh and Mexico to 4 or 5 percent increases in parts of East Asia. Note in particular that Sub-Saharan Africa (excluding South Africa) would gain twice as much as high-income countries when expressed as a percentage of national income, despite the adverse change in the terms of trade for many African countries due in part to the loss of their non-reciprocal tariff preferences.[8]

Policy makers are frequently interested in the extent to which their gains come from their own liberalization relative to liberalization by their trading partners. This was estimated by

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[6] These are the key internationally agreed and bound policy changes. We do not include unilateral and unbound policy changes such as recent reforms in EU and US farm programs.

[7] To get a sense of how important preferences are do developing country and global welfare, we re-ran the model for 2001, prior to the pre-simulation experiment, without those preferences in place. The estimated global welfare gains from reform are then $382 billion instead of $341 billion, and the developing country gains are $150 billion instead of $113 billion. That is, the inclusion of preferences in the database reduces the estimated gains to global, developing country and high-income country welfare by 11, 25 and 2 percent, respectively. Much of the difference is attributable to Sub-Saharan Africa, whose reduction is almost 50 percent. The 25 (and especially 50) percent numbers overstate the difference for developing countries, however, for two reasons. One is that we assume there are no rules of origin or other impediments to developing countries fully utilizing their preferences. The second is that we also assume importers in the preference-providing rich countries do not use their power to gain a disproportionate share of the rent from that preferential access. In practice neither of these assumptions hold, according to recent case studies (e.g., Olarreaga and Özden 2005, Özden and Sharma 2004).

[8] This would be even more so if African reforms were accompanied by complementary domestic policy reforms and investments in trade-facilitating infrastructure and institutions (funds for which may be forthcoming in the proposed 'aid for trade' package that may accompany a Doha agreement – see Nielson 2006). For more detailed disaggregation of the results for Sub-Saharan Africa, see Anderson, Martin and van der mensbrugghe (2006c).

solving the model once for each region, in each case considering only liberalization by that region. Column 2 of Table 1 shows the total gains from multilateral liberalization while Column 1 shows the gains that would result without liberalization by the region—that is, the gain from improved access to partners' markets that Bagwell and Staiger (2002) suggest is the primary motivation for engaging in multilateral trade reforms. It reveals that, for regions with high agricultural protection (eg Western Europe, Northeast Asia, Middle East), a large proportion of the gain comes from own-country reform. But for many of the more-open economies, the majority of the gain comes from increased market access in other countries. Even in the case of Sub-Saharan Africa, 40 percent of the gains ($1.0bn out of $2.5bn) would come from other regions' reforms, despite the much-lamented losses from preference erosion in industrial-country markets. These results suggest that the benefits of a multilateral round could be substantially above the benefits available through unilateral liberalization alone.[9]

The second pair of columns in Table 1 shows the income effects of changes in the international terms of trade for each country. For developing countries as a group the terms of trade effect is negative, reducing somewhat the gains from improved efficiency of domestic resource use (especially in China and India). A comparison of columns 4 and 5 of Table 1 reveals that it is mainly own-country reform that is lowering developing countries' terms of trade. Under the Armington assumption used in this model, the terms-of-trade losses are over-estimated because no allowance is made for the expansion in the number or quality of exported goods resulting from reform (see Hummels and Klenow 2005).

There are several other ways to decompose the real income gains from full global trade reform so as to better understand the sources of the gains for each region. One way is to assess the impacts of developing country liberalization versus industrial country liberalization in different economic sectors; another is to decompose by policy instrument. For agricultural reform, the latter gives results very similar to those from the GTAP-AGR model reported in

[9] This result depends heavily on the size of the models' Armington elasticities. Those in the Linkage model are about one-third larger than in the standard GTAP model on average, reflecting our focus on a longer (decade-long) adjustment period. The Armington elasticities would have to be even larger than those in the LINKAGE model to get more of a WYDIWYG result ("what you do is what you get"). There is a fundamental problem with the Armington approach in that it assumes countries export more of the same products following liberalization, while Kehoe and Ruhl (2002) show that much of the expansion following liberalization is typically in new products, a response that reduces the adverse terms of trade impacts of export growth. Unfortunately, estimates of response elasticities that take adequate account of this phenomenon are not yet available.

Hertel and Keeney (2006), who estimate that market access barriers explain 93 percent of the welfare effects of agricultural policies, with domestic support and export subsidy removal contributing only 5 and 2 percentage points, respectively.[10]

Our results when decomposed by sector are provided in Table 2. They suggest global liberalization of agriculture and food contributes 63 percent of the total global gains (similar to Hertel and Keeney's 66 percent). This is consistent with the high tariffs in agriculture and food (17 percent global average) versus other sectors, but is nonetheless remarkable given the low shares of agriculture in global GDP (4 percent) and global merchandise trade (9 percent). The proportion is even higher for Sub-Saharan Africa, where more than three-quarters of its welfare gain would come from agriculture.

Seven-tenths of the global gains from agriculture are accounted for by the farm policies of high-income countries, and those policies also account for the majority of the overall gains to high-income countries. For developing countries, as much of their gain from farm reform would come from South-South agricultural liberalization as from developing countries getting unrestricted access to high-income country markets. That is almost equally true in manufacturing in aggregate, despite the big gains from textiles and clothing reform ($14 billion from market access in high-income countries compared with $9 billion due to South-South textiles trade growth). In other words, reform by developing countries is equally as important in terms of economic welfare gains to the South as reform by high-income countries. Notice also that developing country gains from high-income country reform are only half as large from textiles as from agricultural policies.

What impact would the removal of cotton trade distortions and subsidies (which raise producer prices by more than 50 percent in the US and even more in the EU) have in this context of freeing all merchandise trade and agricultural subsidies? The price of cotton in international markets is estimated to rise on average by 21 percent above the 2015 baseline because US subsidies would no longer depress that price. However, the volume of US cotton exports would shrink when those subsidies are removed, raising the price and volume of other countries' exports. In particular, cotton output and exports from Sub-Saharan Africa would be 44 and 73

[10] Hoekman, Ng and Olarreago (2004) reach a similar conclusion from estimating the effects of halving each of the three types of agricultural distortions, in their case using partial equilibrium analysis. For an intuitive, non-technical explanation of this result -- which has surprised many observers -- see Anderson, Martin and Valenzuela (2005).

percent larger, respectively, under this full liberalization scenario, with the value of both the output and export rises being greater than for any other region including Latin America and Australia (where there are more other agricultural-expansion opportunities than in Africa where preference erosion would occur). Indeed cotton is so important in Sub-Saharan Africa minus South Africa that it contributes one-quarter of the region's net gain in agricultural value added from full global trade and subsidy liberalization. The share of all developing countries in global cotton exports would be 85 percent instead of 56 percent in 2015, further vindicating the efforts to ensure cotton receives specific and substantial attention in the Doha negotiations (Baffes 2005; Sumner 2006).

The above results are for full trade liberalization. Smaller changes can be expected to result from partial reforms of the sort being negotiated currently under the Doha Development Agenda. It is to those that attention now turns.

Prospective Doha scenarios: estimating their consequences

The scenarios

What will the Doha package ultimately contain? We assume agricultural export subsidies are eliminated by 2013, and that domestic support for agriculture is cut in just four economies: by an average of 28 percent for the U.S., 18 percent for Norway, 16 percent for the EU and 10 percent for Australia (relative to 2001 levels, as explained above). More difficult to determine are the likely nature and extent of reductions in market access barriers, so a number of scenarios are considered initially for agricultural and food products in isolation of non-agricultural tariff cuts, before incorporating also some non-agricultural market access.[11] Throughout this section, the WTO usage of the term 'developing countries' applies when allocating Special and Differential Treatment (SDT) in the form of lesser commitments to reform, which means Hong Kong (China), Korea, Singapore and Taiwan (China) are all able to enjoy SDT despite their high-income status.

The experiments begin for ***Scenario 1*** with a progressive or tiered reduction formula with marginal agricultural tariff rate reductions of 45%, 70% and 75% within each of the three bands

[11] As suggested in the Girard Text (see WTO 2003a), we assume that in the absence of a bound tariff on a good it will be treated as being double the applied MFN rate.

defined by the Harbinson (WTO 2003b) inflection points of tariff rates of 15 and 90 percent for developed countries (that is, for low agricultural tariffs the marginal rate of reduction is 45%, for medium-level tariffs it is 70%, and for the highest tariffs it is 75%), and for developing countries the reductions are 35%, 40%, 50% and 60% within each of their four bands (except least developed countries are not required to undertake any reduction commitments). Even these large cuts to bound tariffs (which are about half way between those proposed by the US and the EU in late 2005 in the lead-up to the Hong Kong Ministerial meeting) would lead to the average applied tariffs on agricultural and food products in 2015 being only one-third lower globally (10.0 instead of 15.2 percent) and 12.5 instead of 14.2 percent for developing countries.

Scenario 2 examines the consequences of including "Sensitive" farm products as allowed for in the July Framework, with developed countries allowed to treat 2% of their HS6 agricultural tariff lines as sensitive and, we assume, subject to just a 15 percent tariff cut[12] , and double those proportions of products for both developing and least developed countries, in part to incorporate also their demand for "Special" products treatment.[13] This would lead to the average agricultural tariff falling only to 13.5 percent in both high-income and developing countries.

Scenario 3 considers the effects of adding to Scenario 2 a tariff cap of 200% such that any product with a bound tariff in excess of that limit will be subjected to a reduction down to that cap rate, which leads to average cuts in agricultural tariffs of 18 percent for both developed and developing countries. This would lead to the average agricultural tariff falling in 2015 considerably more for high-income countries (to 11.5 percent) and but only very slightly more (to 13.3 percent) for developing countries.

Scenario 4 adds to Scenario 1 the cuts in non-agricultural tariff bindings of 50 percent in developed countries, 33 percent in developing countries, and zero in least-developed countries. That lowers the average tariff on all merchandise from 2.9 percent in the baseline to 1.6 percent for high-income countries and from 8.4 to 7.5 percent for developing countries.

Finally, ***Scenario 5*** makes developing (including least-developed) countries full participants in the round, undertaking the same reductions in bound (but not necessarily applied)

[12] Some proposals involve larger cuts in tariffs on these goods.

[13] As described in Jean, Laborde and Martin (2006), "Sensitive" farm products are chosen for each country by taking into account the importance of the product, the height of its existing tariff, and the gap between its bound and applied tariffs in that country.

tariffs as the developed countries in Scenario 4. That lowers the average tariff on all merchandise for developing countries from 8.4 to 6.8 instead of 7.5 percent, a cut of almost one-fifth in this case instead of just one-ninth as in Scenario 4.

Estimated welfare and trade effects of those scenarios as of 2015

The welfare consequences of implementing these various reforms over the 2005-2010 period and allowing the global economy to adjust to 2015 are summarized in Table 3(a) in dollar terms and in Table 3(b) as percentage changes in real income in 2015.

Column 1 of Table 3(a) suggests that agricultural liberalization using the harmonizing formula (Scenario 1) would generate a global gain of $75 billion even without the inclusion of non-agricultural tariff reform. But almost all those benefits accrue to the reforming high-income countries (with whom we include protective Korea and Taiwan (China) as well as Hong Kong (China) and Singapore in this and subsequent tables) such that developing countries would gain only $9 billion because their tariff binding overhang is so great as to lead to almost no cuts in their applied tariffs. Were countries allowed to have lesser cuts for even just 2 percent of their farm products they declare to be "Sensitive" (and another 2 percent in developing countries for their "Special" farm products), those global gains would shrink to just $18 billion and developing countries as a group would be worse off (Scenario 2). If such exceptions are to be made, it would be important to exploit the opportunity – provided for in the Ministerial Declaration – to put a cap on bound tariffs. Scenario 3 shows that even a cap as high as 200%, would restore at least half of the welfare gain foregone by allowing such exceptional treatment for "Sensitive" and "Special" farm products.

The final two scenarios add non-agricultural tariff cuts to the agricultural reforms in the preceding scenarios. In scenario 4, lesser cuts are provided for developing countries' non-agricultural tariffs, as is the case for all the preceding agricultural cut scenarios. Even so, the gain to developing countries doubles by adding these non-farm reforms, relative to Scenario 1 where only agriculture is cut, contributing one-third of the extra boost to global welfare ($7.1 billion out of the $21.6 billion difference between the global gains from Scenarios 1 and 4). In Scenario 5, the developing (including least-developed) countries fully engage in the reform process, foregoing the lesser cuts provided for in Scenarios 1 to 4. That boosts their and global welfare substantially, because their cuts in bound tariffs lead to considerably larger cuts in applied tariffs.

Nonetheless, the global average merchandise tariff hardly changes if there were just agricultural reform, whereas it falls by almost one-third or 1.5 percentage points when manufacturing is included in the reform package.

Retaining lesser cuts for developing countries as in Scenario 4 would yield a global gain of $96 billion from Doha merchandise liberalization, which is a sizable one-third of what is on the table (the potential welfare gain from full liberalization of $287 billion, reported in Table 1). But for developing countries the gain would be only $16 billion, which is less than one-fifth of that group's potential gain shown in Table 1 of $86 billion. If developing countries forego the option of reforming less than developed countries, their gain would rise by 42 percent, or an extra $7 billion. Much of those gains go to the largest developing economies, but note that, in percentage terms, Sub-Saharan Africa also gains substantially if it liberalizes more – contrary to the presumptions of many commentators. By contrast, in Scenario 4 the 'Rest of Sub-Saharan Africa' countries simply are not liberalizing enough to get sufficient efficiency gains to offset the terms of trade losses suffered either as net food importers, or as recipients of tariff preferences that have eroded with the decline in high-income countries' MFN tariffs, or because of the combined export growth from reforming economies with similar export compositions.[14]

How big would be the consequences of partial reform for farm output and employment growth over the Doha implementation period post-2004? If there were completely free trade, farm output would decline (instead of growing slightly) in just the EU and Japan while growing slower in a few other highly protective countries – but, for most countries/regions, farming activities would expand. The Doha Scenario 4 would involve much less reform than a move to free trade, and hence a much slower loss of farm output for the EU and Japan – but also less output growth than under free trade for the vast majority of countries where farm output would be greater. For most of the protective economies, Doha Scenario 4 would simply slow the growth of farm output a little over the coming decade. The farm employment picture is somewhat different. Typically, economic growth leads to declines in not only the relative importance of agriculture but also in absolute numbers employed in farming once a country reaches middle-income status. Thus it is not surprising that numerous middle- and high-income countries are projected to lose farm jobs over the next decade in our baseline scenario. For the most protected

[14] Details of our results for Sub-Saharan Africa can be found in Anderson, Martin and van der Mensbrugghe (2006c).

farm sectors, that rate of farm employment decline would more than double if the world were to move to completely free trade; but it would increase only slightly under Doha Scenario 4. For most developing economies, though, farm employment would grow a little faster under that Doha scenario as compared with the baseline, allowing them to absorb more workers on their farms (Anderson, Martin and van der Mensbrugge 2006a, Table 12.17).[15]

How is this reflected in agricultural net income (value added by the farming sector)? Table 4 shows, not surprisingly, that agricultural value added would fall in those regions with the highest agricultural protection (Europe, Northeast Asia and to a lesser extent the US). However, in the Doha reform scenario none of the developing countries/regions shown in Table 4 would suffer a decline in agricultural net income, despite the lowering of their own agricultural tariffs. The reason for their farmers faring better than protected rich-country farmers – even though the average agricultural tariff in developing countries is nearly as high as that in high-income countries (14.2 percent compared with 15.9 percent in the baseline) – is because a much larger proportion of developing country agriculture is producing exportables that do not have to be protected from imports. This result has clear implications for poverty alleviation, given that perhaps as many as 70 percent of the world's poor are in farm households in developing countries.

The trade consequences of Doha Scenario 4 are summarized in Table 5. The first column shows that by 2015, annual developing country exports would be greater by $41 billion for agricultural products, $25 billion for textiles and clothing, and $12 billion for other manufactures. Their total increase of $78 billion is somewhat smaller than that for high-income countries ($135 billion), but that difference is less when expressed in percentage terms (a 2.6 percent increase for developing countries, compared with 3.1 percent for high-income countries). This takes global merchandise trade one-fifth the way to where it would be if the move was to completely free trade in merchandise.[16]

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[15] This finding of only small intersectoral labor movements in response to partial trade reform is consistent with econometric evidence of adjustments to past trade reforms (see, e.g., Wacziarg and Wallack 2004).

[16] It also raises the share of agricultural and food production that is exported globally, from 9.5 to 10.0 percent, which is one-seventh of the way towards its share of 13.2 percent under the free trade scenario. Even in the protected countries this ratio rises a little or, in the case of Europe, falls only very slightly. This is because of farm resources moving from currently protected import-competing sub-sectors to more-competitive farming sub-sectors. See Anderson, Martin and van der Mensbrugghe (2006a, Table 12.18).

Finally, of interest to those concerned that poor consumers would face higher food bills are the changes that might be expected in average food prices in international markets under the various Doha scenarios. Table 5 shows that for agriculture as a whole, prices would rise less than 2 percent over the ten-year phase-in period. The changes could be as high as 12 percent for dairy products, 6 percent for cotton, and 3-4 percent for coarse grains, oilseeds, sugar and meat, but well under 2 percent for other farm products. Thus the annual change in basic food prices at the retail level would hardly be discernable even to poor consumers, thanks to the supply responsiveness of farmers to the increases in market access opportunities when agricultural subsidies and tariffs are reduced.

Some caveats

Results such as those presented above are always dependent on the assumptions, data and parameters underlying them and so are subject to numerous qualifications. One particularly important qualification concerns the way preferences are treated in the Version 6 GTAP database. In previous versions of that database, only key *reciprocal* preferences were included (notably between members within the EU, NAFTA, ASEAN and Australia-New Zealand regional integration arrangements). Version 6 includes *non-reciprocal* tariff preferences provided by developed countries for their imports from developing countries under arrangements such as the Generalized System of Preferences (GSP), the EU's Africa, Caribbean and Pacific (ACP) program and Everything But Arms (EBA) agreement, and the US's Africa Growth and Opportunity Act (AGOA) and Caribbean Basin Initiative (CBI). We have assumed that there are no rules of origin (ROOs) or other compliance requirements which raise the cost of utilizing these preferences; and we have assumed that the full benefit of the preferences flows to developing countries (even though developed country importers often have more market power than the developing country exporters of standard commodities such that the latter receives a smaller share of the rents).[17] We therefore overstate the extent of preference erosion that would

[17] Evidence that the preference margin is often eroded by complex rules of origin, and that the rent is shared between importing and exporting countries with the latter getting less the more trade is concentrated on standard commodities, can be found in Olarreaga and Ozden (2005) and Ozden and Sharma (2004). A recent partial equilibrium study found that in practice export revenue losses from preference erosion are likely to be limited to a small subset of countries, primarily small island economies dependent on exports of sugar, bananas and, to a far lesser extent, textiles and clothing (Alexandraki and Lankes 2004).

occur for especially least-developed countries, and so understate their gains from multilateral trade reform. If instead those non-reciprocal preferences were excluded from the database, we would overestimate the preference-receiving countries' gains from developed country trade reform.[18]

Another important issue is the extent to which our model captures the supply-side constraints to adjustment by low-income countries to international price chances. Our elasticities are aimed at representing adjustment to long term changes, but are still small compared with those used by some other analysts (e.g., Harrison et al. 2004). Other models, including GTAP-AGR (e.g., Hertel and Keeney 2006), use smaller trade elasticities than ours that generate smaller gains globally and for developing countries, with some regions (including parts of Sub-Saharan Africa) even losing slightly. The uncertainty about the values of these elasticities is a fundamental problem associated with pervasive measurement errors and uncertainty about the true model structure (Hummels and Klenow 2005).

Also to be kept in mind is that global CGE models such as ours necessarily have to aggregate across sectors, thereby reducing the large variance in tariffs that are evident at the HS6 or greater levels of disaggregation. Since the welfare cost of a tariff is roughly proportional to the square of its height, this aggregation leads to under-estimation of that cost.

The above analysis does not include costs of adjustment to reform, but the structural changes that take place over time in the normal course of economic growth are typically very much larger than the small changes that would accompany gradual and partial trade liberalization (as shown in Anderson, Martin and van der Mensbrugghe 2006d). Furthermore, adjustment assistance scheme (financed by foreign aid in the case of low-income countries) are a way to help fund adjustment to tariff and subsidy cuts – and they are just one-off payments, whereas the benefits of reform continue into the future.

Nor has this analysis taken account of the fact that trade reform typically boosts factor productivity and that not all sectors are subject to constant returns to scale and perfect competition. Most models that allow increasing returns and imperfect competition in some

[18] The extent of overstatement would not be large though, since the difference in the low-income countries' estimated benefits even from full liberalization is only $2 billion p.a. when non-reciprocal preferences are excluded instead of included in the LINKAGE model's database, or $8 billion when middle-income countries are also included (van der Mensbrugghe 2005b). A further complication is that the ACP non-reciprocal preference scheme is scheduled to be replaced from 2008 with reciprocal Economic Partnership Agreements (EPAs) between regional groupings of those countries and the EU.

sectors generate higher gains from trade reform, although there is the possibility of the opposite outcome if reform induces resources to move back into an agricultural sector that has sufficiently fewer economies of scale than the rest of the economy.[19]

Implications for developing countries

The good news in this paper is that there are still large potential gains from liberalizing merchandise trade under Doha, with global gains of the order of $95-120 billion per year from an agreement consistent with the Hong Kong Ministerial Declaration, even if no reforms are forthcoming in services, , and with a disproportionately high share of that potential gain available for developing countries (relative to their share of the global economy). Moreover, it is the poorest people in developing countries that appear to be most likely to gain from global trade liberalization, namely farmers and unskilled laborers in developing countries.[20]

To realize that potential gain, it is in agriculture that by far the greatest cuts in bound tariffs and subsidies are required. However, the political sensitivity of farm support programs, coupled with the complexities of the measures introduced in the Uruguay Round Agreement on Agriculture and of the modalities set out in the Ministerial Declaration, ensure the devil will be in the details of the final Doha agreement. Outlawing agricultural export subsidies is the obvious first step. That will help bring agriculture into line with other sectors, and in the process help to limit the extent to which governments encourage agricultural production by other means (since it would remove one option for, and hence raise the cost of, surplus disposal). Concurrently, domestic support bindings must be cut very substantially to reduce binding overhang. Even more importantly, agricultural tariff bindings must be cut hugely so that some genuine market opening can occur. Yet allowing lesser cuts for even just a few "Sensitive" and "Special" farm products would reduce hugely the gains from reform, given the tariff peaks currently in place. If it turns out to be politically impossible not to designate some products as "Sensitive" and "Special", the resulting welfare cost could be reduced by imposing a tariff cap such that any product with a

[19] An example is the study by Francois, van Meijl and van Tongeren (2005), whose 50 percent global reform scenario yields only a 0.5 percent global income gain despite economies of scale, imperfect competition and variety effects, and with agriculture contributing less to those gains than in the above results because farming, unlike other sectors, is assumed to be subject to constant returns.

[20] For detailed analyses of the poverty consequences of the above Doha scenarios, see Hertel and Winters (2006).

bound tariff in excess of, say, 100 percent had to reduce it to that cap rate. Expanding non-agricultural market access at the same time as reforming agriculture would increase the prospects for a successful conclusion to the DDA.

An essential part of the DDA is South-South "concessions", especially for developing countries, because that is where half their potential benefits lie. That means reconsidering the extent to which developing countries liberalize. Since developing countries are trading so much more with each other now than in the 1980s, they are the major beneficiaries of reforms within their own regions. Even least developed countries need to consider reducing their tariff binding overhang at least, since doing that in the context of the Doha round gives them more scope to demand "concessions" (or compensation for preference erosion or other contributors to terms of trade deterioration) from richer countries than if they hang on to the opportunity, provided in the July Framework, not to engage in reform.

What emerges from our analysis is that developing countries would not *have* to reform very much under Doha, because of the large gaps between their tariff bindings and applied rates. But to realize more of their potential gains from trade, they would need to commit to additional trade (and complementary domestic) reforms, and to invest more in trade facilitation. High-income countries could encourage them to do so not only by being willing to open up their own markets more to developing country exports but also by providing more targeted aid. To that end, a new proposal has been put forward to reward developing country commitments to greater trade reform with an expansion of trade-facilitating aid, to be provided by a major expansion of the current Integrated Framework which is operated by a consortium of international agencies for least developed countries (Hoekman and Prowse 2005, Nielson 2006). This may well provide an attractive path for developing countries seeking to trade their way out of poverty. As well, it is potentially a far more efficient way for developed countries to assist people in low-income countries than the current systems of tariff preferences.

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Table 1: Impacts on real income from removing all global merchandise trade distortions (including agricultural subsidies), without and with own-country participation, by country/region, 2015

(changes relative to the baseline, in 2001 dollars and percent)

	Real income gain p.a. ($billion)		**That due just to change in terms of trade** ($billion)		***Total gain as % of baseline income***
	From other countries' reforms	From own + others' reforms	From other countries' reforms	From own + others' reforms	*From own + others' reforms*
Australia and New Zealand	6.2	6.1	4.4	3.5	*1.0*
EU 25 plus EFTA	40.6	65.2	29.7	0.5	*0.6*
United States	21.6	16.2	18.8	10.7	*0.1*
Canada	1.7	3.8	1.2	-0.3	*0.4*
Japan	17.4	54.6	13.7	7.5	*1.1*
Korea and Taiwan (China)	17.0	44.6	10.0	0.4	*3.5*
Hong Kong (China) and Singapore	8.7	11.2	6.6	7.9	*2.6*
Argentina	4.0	4.9	1.9	1.2	*1.2*
Bangladesh	0.0	0.1	-0.1	-1.1	*0.2*
Brazil	11.8	9.9	7.4	4.6	*1.5*
China	16.6	5.6	12.5	-8.3	*0.2*
India	3.9	3.4	1.3	-9.4	*0.4*
Indonesia	3.6	1.9	1.5	0.2	*0.7*
Thailand	9.8	7.7	3.9	0.7	*3.8*
Vietnam	2.4	3.0	1.5	-0.2	*5.2*
Russia	-1.0	2.7	0.2	-2.7	*0.6*
Mexico	-1.2	3.6	0.9	-3.6	*0.4*
South Africa	1.1	1.3	0.7	0.0	*0.9*
Turkey	2.1	3.3	1.3	0.2	*1.3*
Rest of South Asia	1.9	1.0	0.7	-0.8	*0.5*
Rest of East Asia	2.8	5.3	1.8	-0.9	*1.9*
Rest of LAC	11.8	10.3	5.3	0.0	*1.2*
Rest of ECA	0.8	1.0	0.7	-1.6	*0.3*
Middle East and North Africa	5.4	14.0	3.3	-6.4	*1.2*
Selected SSA countries[a]	1.1	1.0	0.8	0.5	*1.5*
Rest of Sub-Saharan Africa	1.0	2.5	0.9	-2.3	*1.1*
Rest of the World	3.2	3.4	1.5	0.1	*1.5*
High-income countries		**201.6**		**30.3**	***0.6***
WTO Developing countries		***141.5***		***-21.4***	***1.2***
Developing countries (World Bank def'n)		**85.7**		**-29.7**	***0.8***
Middle-income countries		69.5		-16.7	*0.8*
Low-income countries		16.2		-12.9	*0.8*
East Asia and Pacific		23.5		-8.5	*0.7*
South Asia		4.5		-11.2	*0.4*
Europe and Central Asia		7.0		-4.0	*0.7*
Middle East and North Africa		14.0		-6.4	*1.2*
Sub-Saharan Africa		4.8		-1.8	*1.1*
Latin America and the Caribbean		28.7		2.2	*1.0*
World total		**287.3**		**0.6**	***0.7***

[a] The selected Sub-Saharan African countries (for which national modules are available in the LINKAGE Model) include Botswana, Madagascar, Malawi, Mozambique, Tanzania, Uganda, Zambia, Zimbabwe. *Source:* Authors' World Bank LINKAGE model simulations

Table 2: Regional and sectoral source of gains from full liberalization of global merchandise trade, developing and high-income countries, 2015

(Change in real income in 2015 relative to baseline scenario)

	Gains by region in $billion			Percent of regional gain				
	All developing	*All high-income*	*World*	*All developing*	*Middle-income*	*Sub-Saharan Africa*	*All high-income*	*World*
Developing countries liberalize:								
Agriculture and food	28	19	47	33	*34*	*35*	9	17
Textiles and clothing	9	14	23	10	*12*	*11*	7	8
Other merchandise	6	52	58	7	*1*	*14*	26	20
All sectors	43	85	128	50	*47*	*60*	42	45
High-income countries liberalize:								
Agriculture and food	26	109	135	30	*31*	*43*	54	47
Textiles and clothing	13	2	15	15	*15*	*-0*	1	5
Other merchandise	4	5	9	5	*7*	*-3*	2	3
All sectors	43	116	159	50	*53*	*40*	57	55
All countries liberalize:								
Agriculture and food	54	128	182	63	*65*	*78*	64	63
Textiles and clothing	22	16	38	25	*27*	*11*	8	14
Other merchandise	10	57	67	12	*8*	*11*	28	23
All sectors	86	201	287	100	*100*	*100*	100	100

[a] Small interaction effects are distributed proportionately and numbers are rounded to sum to 100 percent

Source: Authors' World Bank LINKAGE model simulations

Table 3: Change in real income in alternative Doha scenarios, 2015
(2001 $billion and percentage changes from baseline)

	(a) Dollar change					(b) Percentage change				
	Scen. 1	Scen. 2	Scen. 3	Scen. 4	Scen. 5	Scen. 1	Scen. 2	Scen. 3	Scen. 4	Scen. 5
Australia & New Zealand	2.0	1.1	1.2	2.4	2.8	0.35	0.20	0.20	0.42	0.48
EU 25 plus EFTA	29.5	10.7	10.9	31.4	35.7	0.29	0.11	0.11	0.31	0.36
United States	3.0	2.3	2.1	4.9	6.6	0.02	0.02	0.01	0.03	0.05
Canada	1.4	0.5	0.4	0.9	1.0	0.15	0.05	0.05	0.10	0.11
Japan	18.9	1.8	12.9	23.7	25.4	0.38	0.04	0.26	0.48	0.51
Korea and Taiwan (China)	10.9	1.7	15.9	15.0	22.6	0.86	0.13	1.26	1.19	1.79
Hong Kong and Singapore	-0.1	-0.1	-0.2	1.5	2.2	-0.02	-0.03	-0.04	0.35	0.52
Argentina	1.3	1.0	1.0	1.3	1.6	0.32	0.26	0.26	0.34	0.39
Bangladesh	0.0	0.0	0.0	-0.1	-0.1	-0.06	-0.03	-0.04	-0.10	-0.09
Brazil	3.3	1.1	1.1	3.6	3.9	0.50	0.16	0.17	0.55	0.59
China	-0.5	-1.5	-1.1	1.7	1.6	-0.02	-0.06	-0.04	0.07	0.06
India	0.2	0.2	0.2	2.2	3.5	0.02	0.03	0.02	0.25	0.40
Indonesia	0.1	0.2	0.0	1.0	1.2	0.05	0.07	0.01	0.37	0.44
Thailand	0.9	0.6	0.8	2.0	2.7	0.43	0.29	0.38	0.99	1.33
Vietnam	-0.1	0.0	-0.1	-0.5	-0.6	-0.20	-0.09	-0.16	-0.83	-0.97
Russia	-0.3	-0.7	-0.7	0.8	1.5	-0.06	-0.16	-0.15	0.16	0.31
Mexico	-0.2	-0.3	-0.3	-0.9	-0.2	-0.02	-0.04	-0.04	-0.11	-0.02
South Africa	0.1	0.3	0.3	0.4	0.7	0.06	0.17	0.17	0.25	0.49
Turkey	0.6	0.0	0.0	0.7	1.4	0.25	0.02	0.02	0.26	0.55
Rest of South Asia	0.2	0.1	0.2	0.3	0.7	0.13	0.05	0.14	0.17	0.39
Rest of East Asia	0.1	0.0	1.0	0.3	0.6	0.02	0.01	0.36	0.09	0.22
Rest of LAC	3.7	0.5	0.4	3.9	4.0	0.44	0.06	0.04	0.46	0.47
Rest of ECA	-0.2	-0.3	-0.2	-0.6	-0.7	-0.06	-0.09	-0.08	-0.22	-0.26
Middle East & N. Africa	-0.8	-1.2	-1.2	-0.6	0.1	-0.07	-0.10	-0.10	-0.05	0.01
Selected SSA countries	0.1	0.0	0.0	0.1	0.2	0.21	-0.02	-0.05	0.19	0.26
Rest of Sub-Saharan Africa	0.0	-0.3	-0.3	-0.1	0.3	0.02	-0.13	-0.14	-0.02	0.13
Rest of the World	0.4	0.0	0.0	0.6	0.6	0.19	0.00	0.02	0.26	0.28
High-income countries	**65.6**	**18.1**	**43.2**	**79.9**	**96.4**	**0.20**	**0.06**	**0.13**	**0.25**	**0.30**
WTO Dev. countries	**19.7**	**1.2**	**16.8**	**32.6**	**47.7**	**0.17**	**0.01**	**0.14**	**0.27**	**0.40**
Developing countries (WB)	**9.0**	**-0.4**	**1.1**	**16.1**	**22.9**	**0.09**	**0.00**	**0.01**	**0.16**	**0.22**
Middle-income countries	8.0	-0.5	1.0	12.5	17.1	0.10	-0.01	0.01	0.15	0.21
Low-income countries	1.0	0.1	0.0	3.6	5.9	0.05	0.01	0.00	0.18	0.30
East Asia and Pacific	0.5	-0.8	0.6	4.5	5.5	0.01	-0.02	0.02	0.13	0.16
South Asia	0.4	0.3	0.4	2.5	4.2	0.03	0.03	0.03	0.21	0.36
Europe and Central Asia	0.1	-0.9	-0.9	0.8	2.1	0.01	-0.09	-0.09	0.08	0.21
Middle East & N. Africa	-0.8	-1.2	-1.2	-0.6	0.1	-0.07	-0.10	-0.10	-0.05	0.01
Sub-Saharan Africa	0.3	0.0	-0.1	0.4	1.2	0.06	-0.01	-0.02	0.10	0.27
Lat. America & the Carib.	8.1	2.3	2.1	7.9	9.2	0.29	0.08	0.08	0.29	0.33
World total	**74.5**	**17.7**	**44.3**	**96.1**	**119.3**	**0.18**	**0.04**	**0.10**	**0.23**	**0.28**

Source: Authors' World Bank LINKAGE model simulations

Table 4: Impact of reform scenarios on agricultural value added, 2015

(changes in value added relative to baseline, 2001 dollars and percent)

	$billion		**percent change**	
	Full global liberalization	Scenario 4	Full global liberalization	Scenario 4
Australia and New Zealand	6.4	2.4	25.6	9.8
EU 25 plus EFTA	-39.1	-20.4	-26.4	-13.8
United States	-18.2	-6.3	-15.0	-5.2
Canada	3.4	0.9	23.3	5.8
Japan	-17.7	-7.4	-39.5	-16.6
Korea and Taiwan (China)	-9.5	-3.4	-33.3	-12.1
Hong Kong (China) and Singapore	0.1	0.0	7.5	1.4
Argentina	6.1	1.7	33.8	9.4
Bangladesh	-0.5	0.0	-4.4	0.4
Brazil	15.1	5.5	46.3	16.7
China	0.3	1.8	0.1	0.4
India	-17.1	0.4	-8.1	0.2
Indonesia	0.8	0.5	2.7	1.7
Thailand	3.8	1.1	25.0	7.2
Vietnam	0.8	0.0	13.6	0.3
Russia	-1.4	-0.2	-6.5	-0.8
Mexico	0.9	1.2	2.5	3.2
South Africa	0.5	0.1	9.6	1.2
Turkey	-2.0	-0.1	-7.2	-0.3
Rest of South Asia	-0.6	0.8	-1.3	1.8
Rest of East Asia	-0.2	0.5	-0.7	1.9
Rest of LAC	22.9	8.4	30.2	11.1
Rest of ECA	-1.1	-0.1	-1.8	-0.2
Middle East and North Africa	0.3	1.0	0.3	0.9
Selected SSA countries	1.5	0.3	9.1	1.7
Rest of Sub-Saharan Africa	2.3	0.8	5.4	1.9
Rest of the World	3.1	1.0	16.4	5.4
High-income countries	**-74.6**	**-34.2**	**-19.4**	**-8.9**
Developing countries (WB)	**35.6**	**24.8**	**2.9**	**2.0**
Middle-income countries	45.3	20.9	5.3	2.4
Low-income countries	-9.7	3.9	-2.5	1.0
East Asia and Pacific	5.5	3.9	1.1	0.8
South Asia	-18.1	1.2	-6.8	0.5
Europe and Central Asia	-4.5	-0.3	-4.0	-0.3
Middle East and North Africa	0.3	1.0	0.3	0.9
Sub-Saharan Africa	4.3	1.1	6.7	1.8
Latin America and the Caribbean	45.0	16.7	27.4	10.2
World total	**-39.0**	**-9.5**	**-2.4**	**-0.6**

Source: Authors' World Bank LINKAGE model simulations

Table 5: Impact of Doha reform scenarios on average international product prices, 2015

(percent relative to baseline)

	Scen. 1	Scen. 2	Scen. 3	Scen. 4	Scen. 5
Rice	0.9	1.4	1.3	1.7	1.1
Wheat	1.8	1.6	1.6	1.8	1.7
Other grains	3.7	3.5	3.5	3.7	3.5
Oilseeds	4.5	3.9	3.9	4.5	4.4
Sugar	2.8	2.4	2.4	2.9	2.7
Cotton	6.0	5.8	5.8	5.9	5.8
Fruit and vegetables	1.2	0.9	0.8	1.3	1.0
Other crops	0.9	0.5	0.5	1.2	0.8
Vegetable oils and fats	0.7	0.6	0.6	1.0	0.8
Livestock	0.8	0.7	0.7	0.9	0.6
Processed meats	3.5	3.3	3.3	3.5	3.4
Dairy products	11.8	11.8	11.8	11.7	11.8
Other food, bev. and tobacco	0.3	0.5	0.5	0.4	0.1
All agriculture and food	**1.8**	**1.8**	**1.8**	**1.9**	**1.7**
All primary agriculture	2.0	1.7	1.7	2.1	1.9
All processed agriculture	1.7	1.8	1.8	1.8	1.6
Textile and wearing apparel	0.2	0.2	0.2	0.2	-0.1

Source: Authors' World Bank LINKAGE model simulations